

Research Article

Randomized Controlled Trial on the Effectiveness of Yoga in Breast Cancer Patients Receiving Adjuvant Radiation and/or Chemotherapy Following Breast Surgery

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Abstract

The purpose of this investigation was to examine the effect of yoga on improvements in range of motion and muscular strength in women with stage I or II breast cancer receiving adjuvant radiotherapy and/or chemotherapy following breast surgery, and compare these values to a traditional resistance training program. A total of 77 newly diagnosed stage II and III breast cancer patients undergoing surgery followed by adjuvant radiation and/or chemotherapy participated in this investigation. Participants were randomized into an intervention group (yoga) and control group (traditional strength training). Each program took place following surgery, and during adjuvant therapy. The program lasted for 8 weeks. Measurements of muscular strength and upper body range of motion were measured pre- and post-8-week session. Both groups in this investigation reported improvements in muscular strength and flexibility. Statistical analyses revealed a greater increase in muscular strength and flexibility in the yoga group, compared to controls. Overall, this study supports the practice of yoga in recovery from breast cancer surgery.

Introduction

Historically, individuals battling breast cancer were advised by their physicians to avoid any type of strenuous exercise. They were directed to save their strength for the negative effects brought on by their treatments, which were often either surgery, chemotherapy, or radiation; or a combination of the three [1]. Complications during surgery can result in bleeding, damage to neighboring tissue, reaction to anesthesia, and damage to other organs. After surgery, side effects include pain, infections, bleeding, blood clots, and slow recovery of other body functions. Negative effects from chemotherapy or radiation may include fatigue, skin irritation

at the site of the therapy, fever and chills, sore mouth, dry mouth, nausea, vomiting, diarrhea, change in appetite, pain or difficulty swallowing, soreness of the breast, and headaches. Chemotherapy can also produce constipation, loss of appetite, edema in the hands or feet, allergic reaction, itching, shortness of breath, cough, muscle or joint pain, and numbness or tingling in hands or feet [2]. These side effects may be immediate, long-term, beginning after treatment and continuing for an extended amount of time, or late-term, beginning months after the treatment has been completed [1]. Medications given to control these symptoms often come with their own set of possible side effects as well.

In 2010, the American College of Sports Medicine released a roundtable paper in conjunction with the American Heart Association and the American Cancer Society based on the review of literature involving exercise and cancer survivors. They concluded that exercise training was safe during and after cancer treatments [1]. Research indicates that exercise training results in improvements in physical functioning, quality of life, and cancer-related fatigue [1]. Survivors are encouraged to follow the 2008 Physical Activity Guidelines for Americans, adapting their programs based on their specific type of cancer and adverse effects brought on by treatment.

Yoga is a practice that aims to align the body and mind, bringing peace to one's whole being. The Mayo Clinic endorses yoga as a way to fight stress, get fit, and stay healthy. The different types of yoga bring together different combinations of its two main components: poses and breathing. The benefits of yoga include stress reduction, improved sense of well-being, enhanced mood, improved balance, and increases in flexibility, range of motion, strength and management of chronic conditions, such as heart disease, depression, and insomnia.

Recently, studies have found that yoga is beneficial in breast cancer recovery [1,3-9]. A study focusing on menopausal symptoms in breast cancer survivors found that those who participated in a yoga program had improvements in menopausal symptoms, including hot-flash frequency and severity, joint pain, fatigue, sleep disturbance, and vigor. Another study found that a yoga program improved mental health, relaxation, and spiritually. Decreased depression and pain were also noted. Furthermore, participants experienced increased muscular strength, flexibility, range of motion, energy, sleep quality, and control of physiological parameters [10]. Further studies have found that yoga programs increased general health perception and physical functioning scores [7], decreased perceived stress levels and anxiety/depression [6], decreased cortisol levels [11], and decreased emotional irritability, gastrointestinal symptoms, tension, and cognitive disorganization [12]. One study focused on a multiethnic sample of survivors, finding that psychological benefits from yoga extended to all ethnicities tested [13].

However, in light of these benefits, yoga is not commonly prescribed as an exercise intervention for breast cancer survivors. Following surgery, patients are often given informational packets listing range of motion exercises and strength training activities to improve muscular strength and range of motion. If insurance allows, the patient may meet with a physical therapist or exercise physiologist to try and regain functional ability through stretching and traditional resistance training methods. The health benefits of strength training are widely known. This mode of exercise has proven to be effective at improving quality of life, decreasing fatigue, and improving muscular strength and endurance. Yet, sometimes following breast cancer surgery, it may be contraindicated for individuals ex-

periencing anemia, neutropenia, thrombocytopenia, and side effects such as vomiting, diarrhea, swollen ankles, unexplained weight loss/gain, or shortness of breath with low levels of exertion. It is unknown what the most effective strength building program is for breast cancer survivors – yoga or traditional strength training, as current research is conflicting [1,11]. Thus, the purpose of this investigation was to examine the effect of yoga on improvements in range of motion and muscular strength in women with stage II or III breast cancer receiving adjuvant radiotherapy and/or chemotherapy following breast surgery, and compare these values to a traditional resistance training program.

Methods

This randomized controlled trial evaluated the effects of yoga intervention versus individualized exercise therapy in 77 newly diagnosed stage II and III breast cancer patients undergoing surgery followed by adjuvant radiation and/or chemotherapy. An ethical committee of the recruiting cancer center approved this study prior to the onset of any data collection. Patients were included if they met the following criteria: (i) Women with recently diagnosed operable breast cancer, (ii) age between 30 and 70 years, (iii) high school education, (iv) willingness to participate, and (v) treatment plan with surgery followed by either or both adjuvant radiation and chemotherapy. Patients were excluded if they had (i) a concurrent medical condition likely to interfere with the treatment, (ii) any major psychiatric, neurological illness, and/or autoimmune disorders, and (iii) secondary malignancy. The details of the study were explained to the participants and their informed consent was obtained.

Baseline assessments were done on 77 patients prior to their surgery. Fifty-nine patients contributed data to the current analyses at the second assessment (post-surgery-4 weeks after surgery), 57 patients during and following radiation, and 52 patients during and following chemotherapy. The reasons for dropouts were attributed to lack of interest, time constraints, and other concurrent illnesses. The order of adjuvant treatments following surgery differed among the subjects. There were four to six assessments depending on the treatment regimen. The assessments were scheduled at pre- and post-surgery; pre-, mid-, and post-radiation, and chemotherapy. Moreover, all participants in the study received the same dose of radiation (50c Gy over 6 weeks) and prescribed standard chemotherapy schedules (cyclophosphamide, methotrexate, and fluororacil (CMF) or fluororacil, adriamycin, and cyclophosphamide (FAC).

Measures

At the initial visit before randomization, all pertinent demographic information, medical history, clinical data, intake of medications, investigative notes, and conventional treatment

regimen were ascertained from all consenting participants. Subjective symptom checklist was utilized to assess treatment-related side effects, problems with image, and relevant psychological and somatic symptoms related to breast cancer. The checklist consisted of 31 such items each evaluated on two dimensions; severity graded from no to very severe (0–4), and distress from not at all to very much (0–4). These scales measured the total number of symptoms experienced, total/mean severity and distress score, and was evaluated previously in a similar breast cancer population [14].

Table 1. Demographic Characteristics.

	All Subjects (N)	Yoga Group (n)	Control group (n)
Stage of Breast Cancer			
II	34	15	19
III	35	17	18
Menopausal Status			
Pre	30	14	16
Post	37	18	19
Peri	1	1	0
Post hysterectomy	1	0	1
Treatment regimen			
S+RT+CT	44	20	24
S+CT+RT	3	2	1
S+CT	17	9	8
S+RT	5	3	2

S: Surgery, RT: Radiotherapy, CT: Chemotherapy

Randomization

Participants were then randomized before starting any conventional treatment. The intervention group participated in the yoga class and the control group received traditional strength training. Each program took place following surgery, and during adjuvant therapy. The program lasted for 8 weeks. Initially, measurements of muscular strength were measured using the hand grip dynamometer. Upper body range of motion was measured via goniometer. All participants were re-assessed following the 8-week program.

The yoga practices consisted of a set of breathing exercises, range of motion and strengthening exercises, meditation, and guided imagery relaxation techniques with a certified yoga instructor. The sessions began with an interactive session on the philosophical concepts of yoga and stress management techniques (10 min). This was followed by a preparatory practice (50 min) with yoga postures, breathing exercises, and yogic relaxation. Subjects underwent in person sessions during their hospital visits and stay and were asked to practice at home on remaining days. Their instructors through telephone calls, text messages, and daily logs monitored their home practice on a day-to-day basis. The subjects were required to practice yoga for 1 h at least three times a week for 8 weeks.

The control intervention consisted of traditional strength training with a certified cancer exercise specialist. Patients first underwent a comprehensive fitness assessment, mea-

suring body composition, aerobic endurance, flexibility, and muscular strength and endurance. Following this, an exercise program was created and individualized according to each patient's strengths and weaknesses. Patients exercised with a trainer once each week, for 60 minutes each session. Each workout session included a cardiovascular component, flexibility exercises, and whole-body strength training. Each patient did 3 sets of 10 repetitions of 8-10 exercises targeting all the major muscle groups in the body. Patients were also given an at-home workout program and resistabands, and were encouraged to exercise three times each week on their own at home. Their trainers would monitor their exercise compliance through telephone calls, texts, and daily logs.

Statistical methods

Data were analyzed using Statistical Package for Social Sciences version 20.0 for PC windows 2000. Study participants underwent surgery, radiotherapy, and chemotherapy and interventions were compared for each of these treatments. Mean scores for muscular strength were calculated for the complete sample. Since order of their adjuvant treatment differed, an analysis of covariance (ANCOVA) was done to compare groups at each follow-up assessment using the baseline pre surgery measure as a covariate. There were 2 dropouts in yoga and 6 in control group. Alternatively, intent-to-treat (ITT) analyses were done using the initially randomized sample where in the baseline value of noncompleters was carried forward to replace their missing values at subsequent assessments. This was done to assess the potential impact of the missing data on the results.

Table 2. Comparison of post test scores adjusted for baseline scores between groups using ANCOVA at various stages of treatment.

	Pre Surgery	Post Surgery	During RT	
Muscular Strength (kg, Mean ± SE)				
Yoga	55 ± 3.2	51 ± 4.2	59 ± 3.3*	58 ± 2.3*
Control	52 ± 2.5	47 ± 1.2	51 ± 2.2	49 ± 1.4
Flexibility (arm extension, degrees, Mean ± SE)				
Yoga	188 ± 7.8	163 ± 7.9	175 ± 8.5	178 ± 5.6
Control	191 ± 8.5	164 ± 6.6	167 ± 4.4	169 ± 4.7

*P<0.05, adjusted for their baseline scores between yoga and control groups with 95% CI using ANCOVA for P values. SE = Standard Error

Results

A total of 59 women completed the study. There were no dropouts due to injuries. The yoga and control groups were similar with respect to medical characteristics, and heterogeneous in treatment regimen.

Both groups reported improvements in muscular strength and flexibility. Analysis of covariance was done comparing measures between yoga and control groups controlling for baseline differences. Analysis of covariance using baseline muscu-

lar strength scores as a covariate showed a significant increase in muscular strength following surgery ($F(65) = 7.06, P = 0.01$), before radiotherapy ($F(62) = 7.77, P = 0.007$), and following radiotherapy ($F(62) = 17.42, P < 0.001$) in the yoga group as compared to controls. The yoga group also showed increase in flexibility score before chemotherapy ($F(57) = 6.03, P = 0.04$), and after chemotherapy ($F(57) = 10.89, P = 0.002$) as compared to controls.

Discussion

The purpose of this investigation was to examine the effect of yoga on improvements in range of motion and muscular strength in women with stage II or III breast cancer receiving adjuvant radiotherapy and/or chemotherapy following breast surgery, and compare these values to a traditional resistance training program. Both groups in this investigation reported improvements in muscular strength and flexibility. Statistical analyses revealed a greater increase in muscular strength and flexibility in the yoga group, compared to controls. Our results are consistent with other studies examining the effectiveness of yoga and adjuvant psychological therapy that have shown a similar improvement in fitness parameters [15,16].

The ACSM recognizes the benefits of strength training in cancer recovery. Much research today has been dedicated to studying the effectiveness of strength training on muscular strength and flexibility in women following breast cancer. Yet, the most effective mode of strength building exercise is not known [17]. Various dose-response combinations of traditional strength training have been investigated, with conflicting results. Studies have shown that 2 sets of 8-12 repetitions at the intensity of 60-80% of the patient's estimated single maximum repetition was beneficial at improving fatigue and measures of quality of life [18,19]. However, other investigations using similar training programs did not produce the same results [20].

On the other hand, research has revealed that yoga is a highly effective form of exercise in cancer patients [16] improving such symptoms as fatigue, depressive symptoms, physical performance, and quality of life [15]. Besides physical activity, yoga also includes breathing techniques and meditation. Breathing through various postures may help improve flexibility, as it allows the patient to relax and push further through a stretch. In addition, the use of body weight in many of the postures would help improve muscular strength. Participants in yoga seemed to be more motivated to continue with the class than those who participated in the traditional strength training program. When a patient would master a pose or stretch, they were motivated and encouraged to continue with the next class. This was not noted with the control group.

Overall, this study supports the practice of yoga in recovery from breast cancer surgery. While traditional strength training is also effective, patients may benefit from a group setting,

where support and encouragement from others who are on the same journey may help them thrive in their recovery.

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